

REMARKS

Claims 14-16, 19-23 and 25-26 are pending. Please cancel claim 24.

Claims 14-16 and 18-20 stand rejected under 35 U.S.C. 102(b) as being anticipated by Brown et al. (US 5,124,484). Claims 14, 16, 21 and 22 stand rejected under 35 U.S.C. 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Brown et al. (US 5,124,484). Applicants respectfully traverse these rejections.

Brown et al.'s method for preparing a polyisobutene amine is based on reacting a carbonyl functionalized polyisobutene with an amine and hydrogenating the product of that reaction (see, e.g., Brown et al. claim 1).

In contrast, the presently claimed reaction product is obtained by epoxidizing a reactive polyalkene and aminating said epoxide under reductive conditions. The unique reaction mechanism of the present invention causes formation of a characteristic reaction product. The reaction mechanism of the present invention is illustrated by the attached reaction scheme. It was observed that epoxidation of a reactive polyalkene results in formation of two different epoxides Ia and Ib which are aminated to form the aminoalcohols IIa and IIb which aminoalcohols are then reduced to form the amines IIIa and IIIb. A further aminoalcohol IIa is converted under the catalytic conditions of the present invention to a cyanohydrene IV which compound eliminates hydrocyanic acid and forms a ketone V. Addition of the amine yields imine VI which is reduced to amine VII. It is important to note that the number of carbon atoms is reduced by one in amine VII. The equilibrium of reaction IIa  $\leftrightarrow$  VI is further shifted by reduction of the eliminated

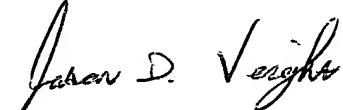
MELDER et al., Ser. No. 09/666,303

hydrocyanic acid. Said shift of equilibrium results in the fact that the characteristic compound VII of the obtained reaction mixture can be found in a proportion of 20-30%. Therefore, the present invention is novel and nonobvious.

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Respectfully submitted,

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IN THE CLAIMS

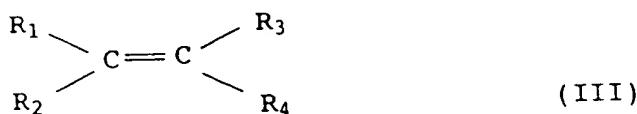
Please amend the claims as follows.

1-13. (canceled)

14. (currently amended) ~~A polyalkene amine which is substantially free of halides~~

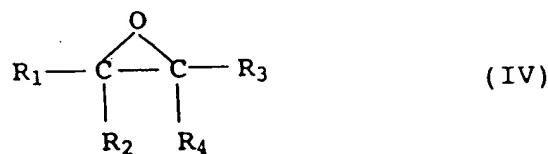
~~and has the formula (I) A reaction product obtained by~~

a) epoxidation of a reactive polyalkene of the formula (III)

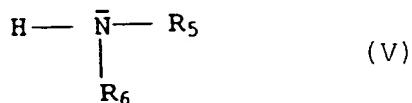


where

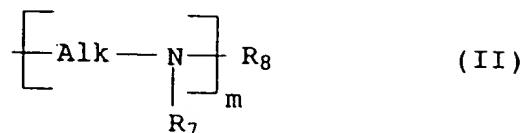
R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub> and R<sub>4</sub>, independently of one another, are each hydrogen or an unsubstituted or substituted, saturated or mono- or polyunsaturated aliphatic radical having a number-average molecular weight of up to 40000, at least one of the radicals R<sub>1</sub> to R<sub>4</sub> having a number average molecular weight of from 150 to 40000, and to form an epoxide of the formula (IV)



b) reaction of the epoxide of formula (IV) with a nitrogen compound of the formula (V)



where  $R_5$  and  $R_6$ , independently of one another, are each hydrogen, alkyl, cycloalkyl, hydroxyalkyl, aminoalkyl, alkenyl, alkynyl, aryl, arylalkyl, alkylaryl, hetaryl or an alkyleneimine radical of the formula (II)



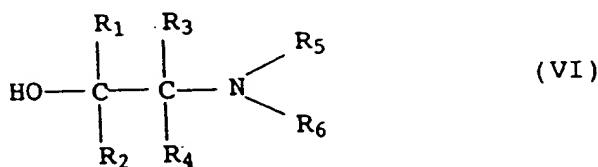
where

Alk is a straight-chain or branched alkylene,

$m$  is an integer from 0 to 10, and

$R_7$  and  $R_8$ , independently of one another, are each hydrogen, alkyl, cycloalkyl, hydroxyalkyl, aminoalkyl, alkenyl, alkynyl, aryl, arylalkyl, alkylaryl or hetaryl or, together with the nitrogen atom to which they are bonded, form a heterocyclic structure,

or  $R_5$  and  $R_6$ , together with the nitrogen atom to which they are bonded, form a heterocyclic structure, it being possible for each of the radicals  $R_5$ ,  $R_6$ ,  $R_7$  and  $R_8$  to be substituted by further alkyl radicals carrying hydroxyl or amino groups, to form an amino alcohol of the formula (VI)

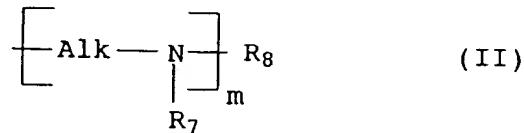


- c) catalytic dehydration of the amino alcohol of formula (VI) and hydrogenation of the dehydrated product.
15. (currently amended) A polyalkene amine The reaction product as defined in claim 14, ~~of the general formula (I)~~, whose polyalkene portion is formed of C<sub>2</sub>-C<sub>4</sub> alkene monomers.
16. (currently amended) A polyalkene amine The reaction product as defined in claim 15, wherein the C<sub>2</sub>-C<sub>4</sub> alkene is 1-butene or isobutene.
- 17-18. (canceled)
19. (currently amended) A polyalkene amine The reaction product as defined in ~~claim 18~~ claim 14, wherein the nitrogen compound is selected from ammonia, ethylene-1,2-diamine, propylene-1,2-diamine, propylene-1,3-diamine, butylene diamines, the mono-, di- and trialkyl derivatives of said amines, polyalkylene polyamines, the alkylene portions of which do not have more than 6 carbon atoms, the N-amino-C<sub>1</sub>-C<sub>6</sub>-alkyl piperazine.
20. (currently amended) A polyalkene amine The reaction product as defined in claim 19, which is derived from a polyalkene epoxide of the general formula (IV), the polyalkene portion of which is formed of 1-butene or isobutene monomers and the amine portion of which is derived from ammonia.
21. (currently amended) A fuel composition containing at least a polyalkene amine The reaction product as defined in claim 14 in a concentration of about 20 to 5000 mg/kg of fuel as an additive for keeping the fuel intake system clean.

5000 mg/kg of fuel as an additive for keeping the fuel intake system clean.

22. (currently amended) A lubricant composition containing as an additive at least one ~~polyalkene-amine reaction product~~ as defined in ~~claim 16~~ ~~claim 14~~ in a proportion of about 1 to 15% by weight, based on the total weight of the composition.
23. (currently amended) ~~A polyalkene amine~~ ~~The reaction product~~ as defined in claim 14, where

$R_5$  and  $R_6$ , independently of one another, are each hydrogen, alkyl, cycloalkyl, aminoalkyl, alkenyl, alkynyl, aryl, arylalkyl, alkylaryl, hetaryl or an alkyleneimine radical of the formula (II)



where

Alk is a straight-chain or branched alkylene,

$m$  is an integer from 0 to 10, and

$R_7$  and  $R_8$ , independently of one another, are each hydrogen, alkyl, cycloalkyl, hydroxyalkyl, aminoalkyl, alkenyl, alkynyl, aryl, arylalkyl, alkylaryl or hetaryl or, together with the nitrogen atom to which they are bonded, form a heterocyclic structure,

or  $R_5$  and  $R_6$ , together with the nitrogen atom to which they are bonded, form a

heterocyclic structure, it being possible for each of the radicals R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub> and R<sub>8</sub> to be substituted by further alkyl radicals carrying amino groups.

24. (canceled)
25. (new) The reaction product of claim 14, wherein the reactive polyalkene has a high fraction of terminal double bonds.
26. (new) An additive composition comprising the reaction product of claim 14.